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IN THE MATTER OF Oaths
and Declaration Ordinance
(Cap. 11)

STATUTORY DECLARATION
OF
CHOW KA YAN

I, CHOW KA YAN, holder of Hong Kong Identity Card number Z 297503 (4)
of Rooms 2504-6, CC Wu Building, 302-308 Hennessy Road, Hong Kong do hereby
solemnly, sincerely and truly declare and say as follows:

I am fully conversant in both the English and the Chinese languages and am qualified to
translate the certified copy of Hong Kong Short-term Patent Application No. 03107911.8,
a copy of which is attached hereto as Exhibit "A", from Chinese into English and its
English translation is attached hereto as Exhibit "B" and I certify that Exhibit "B" is a true
translation into English of the certified copy of Hong Kong Short-term Patent Application
No. 03107911.8.

AND I make this Statutory Declaration, conscientiously believing the same to be true and
by virtue of the Oaths and Declarations Ordinance.

DECLARED by the said CHOW KA)
YAN at Room 2504, CC Wu Building,)
302-308 Hennessy Road, Hong Kong)
this 27th day of February, 2004)



Before me,



Jo S.Y. Chan
Solicitor
Hong Kong SAR

IN THE MATTER OF Oaths
and Declaration Ordinance
(Cap. 11)

STATUTORY DECLARATION
OF
CHOW KA YAN

EXHIBIT A

This is Exhibit A to the Statutory Declaration of CHOW KA YAN declared before
me this 27th day of February, 2004.

Before me,

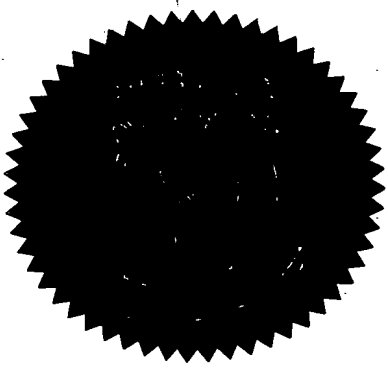

Jo S.Y. Chan
Solicitor
Hong Kong SAR



PATENTS ORDINANCE
Chapter 514
Laws of the Hong Kong Special Administrative Region

The attached is a true copy of the application documents of Short-term Patent No. HK1056476 specified below:

- (i) the Patents Form P6 filed on 3 November 2003;
- (ii) the specification filed on 3 November 2003;
- (iii) the English abstract filed on 3 November 2003; and
- (iv) the Chinese abstract filed on 3 November 2003.



Dated this 25th day of February 2004.

(YIP CHIU YING RITA)
Intellectual Property Examiner
for Registrar of Patents

知識產權署

專利表格第 P6 號
2002 年版
第 6 項費用

專利條例
(第 514 章)

RECEIVED

由本署填寫		REG 03-11-03	16103
2003 NOV -3 PM 4:00		COI	101
專利及外觀設計註冊處 PATENTS & DESIGNS REGISTRIES		P6 CHEQUE	2800.00 2800.00
		REG 03-11-03	16103
		COI	101
		ADV. FEE-PATS CHEQUE	1270.00 1270.00
收件日期			
申請編號		03107911.8	
設定提交日期		3 NOV 2003	

請求批予短期專利
專利條例第 113、116、125 條
專利(一般)規則第 58、74 條

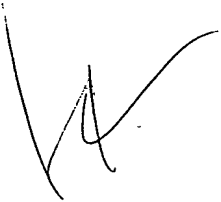
(請細閱本表格末頁的註釋)

01 來件檔號	4464/YW/005
02 申請人資料 (見註釋(4)(a))	
中文姓名/名稱	旭和實業有限公司
中文姓名/名稱的音譯或	
英文姓名/名稱 (在姓氏下劃線)	Yorkwell Industries Limited
地址	香港新界葵涌梨木道 73-77 號 海暉中心 19 樓 6 室
電話	
圖文傳真	
法團註冊種類	有限公司
法團註冊國家	香港
法團註冊州省 (如適用)	

03 發明的名稱 (見註釋(4)(b))	英文	An internal safety structure for toasters	
	中文	多士爐內部安全結構	
04 IPC 的資料 (見註釋(5))	IPC 編碼 A 47 J	IPC 版次 7	
05 使用微生物 (在適當方格加上「√」號) (a) 此項發明是否需要使用微生物才可實行？ (b) 如答「是」，請指出該種微生物是否在此項申請的提交日已可提供予公眾；以及 是否在此項申請或有關專利的說明書中用足以使擅長有關科技的人能夠實行此項發明的方式描述該微生物？ (c) 如在(b)項兩部分問題的答案均為「否」，請提供以下資料： 寄存該微生物的培養物的寄存機構名稱及地址 寄存日期 (年/月/日) 存入編號 (專利(一般)規則第 73 條及附表 1)	<input type="checkbox"/> 是 <input checked="" type="checkbox"/> 否		
	<input type="checkbox"/> 是 <input type="checkbox"/> 否 <input type="checkbox"/> 是 <input type="checkbox"/> 否		
	名稱： 地址：		
06 如短期專利申請是以國際申請為基礎，填寫國際申請的資料 (a) 國際申請編號 (b) 國際申請提交日期 (年/月/日) (c) 國際申請發表編號 (d) 國際申請發表日期 (年/月/日)			

<p>(e) 在中華人民共和國進入國家 階段的日期 或 國家知識產權局的國家申請 號通知書的發文日 (在適當方格加上「√」號及在提供的 位置填上日期)</p>	<div style="display: flex; justify-content: space-between;"> <div style="text-align: center;"> <input type="checkbox"/> (年 / 月 / 日) </div> <div style="text-align: center;"> <input type="checkbox"/> (年 / 月 / 日) </div> </div>								
<p>(f) 中國專利申請編號 (如知悉) (專利條例第 125 條和專利(一般)規則第 78 條)</p>									
<p>07 較早時的申請</p> <p>如此申請屬分開申請或源自較早 時在香港提出的申請，填寫較早 時的申請的資料</p> <p>(a) 聲稱享有較早時的申請所根據的 條文 (見註釋(6)) (在適當方格加上「√」號)</p> <p>(b) 較早時的申請的編號</p> <p>(c) 較早的申請的提交日期 (年/月/日)</p>	<p style="text-align: center;">專利條例</p> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;"> <input type="checkbox"/> 第 116 條 </div> <div style="text-align: center;"> <input type="checkbox"/> 第 55 條 </div> </div>								
<p>08 優先權申請的資料</p> <p>如根據專利條例第 111 條作出聲 稱享有優先權的陳述，填寫每項 優先權申請的資料 (專利(一般)規則第 58(5)(c)、69 條)</p>	<p>陳述</p> <p style="text-align: center;">我們在此聲明此申請不享有優先權</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 33%;">國家</th> <th style="width: 33%;">優先權 申請編號</th> <th style="width: 33%;">優先權申請 提交日期</th> </tr> </thead> <tbody> <tr> <td style="height: 40px;"></td> <td></td> <td></td> </tr> </tbody> </table>			國家	優先權 申請編號	優先權申請 提交日期			
國家	優先權 申請編號	優先權申請 提交日期							
<p>09 發明人資料 (見註釋(4)(a)) (見註釋(7))</p> <p style="text-align: right;">中文姓名/名稱 中文姓名/名稱的音譯或 英文姓名/名稱 (在姓氏下劃線)</p> <p style="text-align: right;">地址</p>	<p>王國平</p> <p><u>WONG KWOK PING</u></p> <p>香港新界葵涌梨木道 73-77 號 海暉中心 19 樓 6 室</p>								

<p>10 不具損害性的披露</p> <p>如申請人按照專利條例第 109 條，就不具損害性的披露提出權利要求，請提供一份有關該項披露的詳情的陳述 (見註釋(8))</p>	<p>陳述</p> <p>我們在此聲明此申請不提出有關權利要求</p>		
	<p>展覽或會議的 名稱及地點</p>	<p>展覽或會議 開始日期</p>	<p>首次披露 日期</p>
<p>11 如按照專利條例第 119 條要求押後批予專利，請在方格加上「(」號及填寫該項押後期間 (押後期間不得超過十二個月) (如方格並無「(」號，則視為毋須押後批予專利)</p>	<div style="display: flex; align-items: center;"> <input style="width: 30px; height: 30px; margin-right: 10px;" type="checkbox"/> <div> <p>要求押後批予專利至 _____</p> <p style="text-align: right;">(年 / 月 / 日)</p> </div> </div>		
<p>12 如提交本表格時附連下列文件，請注明文件的張數</p> <p>(a) 是項請求的附加頁</p> <p>(b) 說明</p> <p>(c) 權利要求的資料</p> <p>(d) 繪圖</p> <p>(e) 撮錄 (中文本及英文本)</p> <p>(f) 有關優先權的文件</p> <p>(g) 有關優先權的文件的譯本</p> <p>(h) 查檢報告</p> <p>(i) 查檢報告譯本</p> <p>(j) 有關國際申請的副本 —</p> <p style="padding-left: 20px;">(i) 由國際局所發表的國際申請</p> <p style="padding-left: 20px;">(ii) 國際查檢報告</p> <p style="padding-left: 20px;">(iii) 由國家知識產權局所發表的譯本</p> <p style="padding-left: 20px;">(iv) 由國家知識產權局所發表關於國際申請的資料</p>	<p>張 數</p>		
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<p>(k) 按照專利條例第 113(2)(c) 條及專利(一般)規則第 65 條所提交的專利表格第 P7 號發明權的陳述 (見註釋(7))</p> <p>(l) 其他 (請註明)</p>	<p>2</p> <p>0</p>
<p>13 代理人姓名/名稱 (如有委任)</p> <p>香港送達地址</p> <p>電話</p> <p>圖文傳真</p> <p>代理人代碼 (如知悉)</p>	<p>中港知識產權服務有限公司</p> <p>香港軒尼詩道 302-308 號集成中心 25 樓 2504-6 室</p> <p>2110 9608</p> <p>2110 9620</p>
<p>14 我/我們向專利註冊處處長請求 批予短期專利</p> <p>簽署</p> <p>簽署人姓名</p> <p>簽署人職銜</p> <p>日期 (年/月/日)</p>	 <p>陳義亨</p> <p>董事</p> <p>2003/11/03</p>

说明书

多士炉内部安全结构

技术领域

本发明涉及一种多士炉内部安全结构，具体涉及一种由低压直流马达驱动的多士炉内部结构，属于保护电路装置领域。

背景技术

多士炉是家庭、餐厅、餐馆的必需品，由来已久。市面上两片装多士炉的基本内部结构是以三块被镍铬合金线作为发热线包着的云母片平行相隔形成两个槽位，每个槽位约阔 36 毫米，刚好各放置一片状面包。所述槽位内设置面包支承架，以承托片状面包。所述面包支承架一侧连接一升降架，而升降架另一侧设绝缘棒及金属体，升降架并连接一外露把手。对应所述绝缘棒及金属体设一电路板，电路板上设有电磁体、电容器、电阻器、晶体管、两极电触点、导电金属条、连接插头的电线等。使用时，插上插头，将片状面包放进槽位，按下把手带动升降架下滑至炉芯之中，并因此同时带动面包支承架下降，升降架上的绝缘棒下插到电路板上导电金属条的位置，接通两极电触点，电路接通，供电给电磁体，电磁体产生磁力吸引金属体，使面包支承架停留于炉芯之中；电路接通后，亦同时使发热线发热，发出红外辐射将片状面包加热及烘干。电路板上的电容器及电阻器配合成定时器，当电容器储够一定的电量，达到一定电压，会自动切断电磁体的电源，因吸力消失，升降架被在其上的弹簧拉动向上升，升降架带动面包支承架同时上升，弹出片状面包；升降架上升时，使绝缘棒升高离开导电金属条，切断电路，停止发热线继续发热。

由于市面上的多士炉在美国多以 110 伏特、在欧亚等地多以 220 至 250 伏特的高压交流电供电操作，若把手或升降架或面包支承架本身升降失灵，未能及时切断电源，小则烤焦面包，严重的可能烧坏多士炉，更有机会引起火灾，造成财物甚至是人命的损失，十分危险。

市面上提供一种具有较安全内部结构的多士炉，参见图 1 及图 2 的现有多士炉内部结构示意图，其结构不利用把手驱动，而是利用马达配合电路板控制各部件操作，其主要结构包括电路板 2'、马达 3'、升降架开关驱动掣柄 4'、限位开关 6'、发热线开关驱动掣柄 11'、升降架 12'、面包支承架 13' 等。使用时，插上插头，电路板上的电容器会限制电流降压，供电给电路板 2' 及马达 3'，将片状面包放进槽位面包支承架 13' 后，即启动光电开关 18'，电路板 2' 发出指令，

马达 3'随即带动升降架开关驱动掣柄 4'逆时针方向旋转，带动升降架 12'下降，连带面包支承架 13'亦同时下降，马达 3'与升降架开关驱动掣柄 4'持续转动，直至触动限位开关 6'后便停止转动，当升降架 12'下降时带动发热线开关驱动掣柄 11'同步下降，启动发热线开关，使发热线发热，并发出电信号至电路板 2'，电路板 2'上设有定时功能的集成电路会开始计时，当预设时间结束，电路板 2'发出指令，马达 3'随即带动升降架开关驱动掣柄 4'逆时针方向旋转，带动升降架 12'上升，连带面包支承架 13'亦同时上升，马达 3'与升降架开关驱动掣柄 4'持续逆时针方向转动，直至触动限位开关 6'后便停止转动，当升降架 12'上升时带动发热线开关驱动掣柄 11'同步上升，离开发热线开关，关闭电源，使发热线停止发热。

虽然具有此内部结构的多士炉不会有把手或升降架失灵的问题，故较一般多士炉安全，但此多士炉的各部件操作均由高压交流马达控制，嘈音较大，若马达失灵或负荷过量而损坏，或电容器失灵，就不能及时切断电源，造成发热线长期发热，仍会烤焦面包、烧坏多士炉，甚至引起火灾，造成财物甚至是人命的损失。

因此，市面上的多士炉内部结构仍未能满足消费者的要求。

发明内容

针对上述问题，本发明的主要目的是提供一种由低压直流马达驱动的多士炉内部安全结构，具有安全可靠、生产成本低廉、耗电量低、经济耐用、嘈音较低等优点。

为实现上述目的，本发明采取如下技术方案：

一种多士炉内部安全结构，包括一电路板、一马达、一升降架等，其特征在于：所述马达为一低压直流马达，所述马达透过齿轮组、离合齿轮组及驱动齿条带动所述升降架升降；所述电路板上安设上感应器及下感应器，感应所述升降架升降水平；所述电路板上安设集成电路，利用独有技术软件，预设操作及控制程序；所述电路板上安设变压器，将交流电降压，再透过一组二极管整流器转换交流电为直流电，供电给所述电路板及所述马达。

所述多士炉内部安全结构，其特征在于：所述齿轮组由一连接所述马达并随其旋转的蜗杆及与其啮合并随其旋转的两个或以上互相啮合的直齿齿轮组成，所述直齿齿轮其中一边与所述离合齿轮组一边啮合。

所述多士炉内部安全结构，其特征在于：所述离合齿轮组由一传动轴及装配其上的离合直齿齿轮、离合弹簧和两个或以上互相啮合的离合齿轮组成，所

述离合齿轮其中一边与所述直齿齿轮啮合，所述离合直齿齿轮其中一边与所述驱动齿条啮合。当所述马达旋转时，所述齿轮组带动其中一个所述离合齿轮转动，所述离合弹簧的张力把转动中的所述离合齿轮推贴第二个所述离合齿轮带动其转动，第二个所述离合齿轮通过所述传动轴带动所述离合直齿齿轮转动，所述离合直齿齿轮带动所述驱动齿条上下移动。当所述升降架发生故障卡死，所述驱动齿条不能上升或下降，所述离合直齿齿轮和第二个所述离合齿轮因此不能顺滑转动，当第一个所述离合齿轮被所述马达及所述齿轮组带动转动时，第一个所述离合齿轮会压缩所述离合弹簧，离开第二个所述离合齿轮，第一个所述离合齿轮与第二个所述离合齿轮在接合处打滑，从而释放所述马达旋转时产生的传动力。

所述多士炉内部安全结构，其特征在于：所述驱动齿条与所述升降架固接，所述驱动齿条一边齿条与所述离合直齿齿轮其中一边啮合。

所述多士炉内部安全结构，其特征在于：所述升降架对应所述上感应器及所述下感应器的位置设掣柄；当所述升降架上升至对应所述上感应器的水平线位置，所述掣柄会触动所述上感应器，所述上感应器会实时发出电信号至所述电路板，所述电路板集成电路预设程序控制所述马达停止旋转，停止所述升降架继续上升；当所述升降架下降至对应所述下感应器的水平线位置，所述掣柄会触动所述下感应器，所述下感应器会实时发出电信号至所述电路板，所述电路板集成电路预设程序控制所述马达停止旋转，停止所述升降架继续下降。

所述多士炉内部安全结构，其特征在于：所述升降架一侧连接多士炉槽位内的面包支承架，另一侧连接所述驱动齿条，所述驱动齿条升降，带动所述升降架随着升降，所述升降架带动所述面包支承架上的片状面包随着升降。

所述多士炉内部安全结构，其特征在于：所述电路板的集成电路，利用独有技术软件，预设定时程序，在预设时间结束后，即自动截断所述马达的电源，避免所述马达继续旋转，以防止所述马达或其它构件发生故障，预设时间为每次 5 至 30 秒。

所述多士炉内部安全结构，其特征在于：所述发热线的电源采用继电器作为开关，所述继电器分别电连接电源、所述电路板及所述发热线，为所述电路板集成电路预设程序操作及控制；当完成预设程序，即自动截断所述继电器电源，继电器随即截断所述发热线的电源；当所述升降架下降程序发生故障，所述下感应器不会发出电信号至所述电路板，所述电路板不会供电至所述继电器，所述继电器不会开启所述发热线，避免所述升降架或所述马达发生故障，

面包卡在槽位内不能升起而有机会造成火灾的危险。

所述多士炉内部安全结构，其特征在于：所述电路板预设一组特别设计的电路，控制当所述电路板计时或电路程序出错或异常或烧坏时，立即发出指令截断发热线的电源，避免多士炉长期通电而有机会造成火灾的危险。

所述多士炉内部安全结构，其特征在于：所述马达、所述齿轮组及所述离合齿轮组藏于一大致封闭的盒体内，所述盒体放置在所述电路板一面，所述盒体封闭所述马达、所述齿轮组及所述离合齿轮组转动时发出的声响，达致减低嘈音的功能。

所述多士炉内部安全结构，其特征在于：所述齿轮组、所述离合齿轮组及所述驱动齿条可添加润滑油脂等减少转动时齿轮之间的摩擦，达致减低嘈音及齿转耗损的功能。

使用多士炉时，插上插头，经过变压器降压，再透过一组二极管整流器转换交流电为直流电，供电给电路板。将片状面包放进槽位面包支承架，开启多士炉，电路板接收指令，向马达发出预定时限的“下降信号”。马达朝一方向开始旋转，带动蜗杆旋转，蜗杆带动直齿齿轮旋转，直齿齿轮带动离合齿轮组旋转，离合齿轮组通过离合直齿齿轮带动驱动齿条下降，驱动齿条下降带动升降架及面包支承架下降，直至下感应器感应到升降架的掣柄，下感应器实时发出“完成下降信号”至电路板，电路板截断马达的电源，马达停止旋转，停止升降架继续下降，电路板随即发出“开始烘烤信号”。若预定时限后电路板仍未收到下感应器的信号，电路板亦会自行截断马达的电源，不会发出“开始烘烤信号”。

当电路板发出“开始烘烤信号”，指令继电器接通电源供电给发热线发热，烘烤面包，此时电路板会开始计时，预设时间结束，电路板便发出“完成烘烤信号”，切断继电器的电源，继电器随即截断发热线的电源，发热线停止发热，电路板随即发出预定时限的“上升信号”。马达开始朝反方向旋转，带动蜗杆反向旋转，蜗杆带动直齿齿轮反向旋转，直齿齿轮带动离合齿轮组反向旋转，离合齿轮组通过离合直齿齿轮带动驱动齿条上升，驱动齿条上升带动升降架及面包支承架上升，直至上感应器感应到升降架的掣柄，上感应器实时发出“完成上升信号”至电路板，电路板截断马达的电源，马达停止旋转，停止升降架继续上升。若预定时限后电路板仍未收到上感应器的信号，电路板亦会自行截断马达的电源。

由于本发明采用上述技术方案，具有多重自动断电装置，不单安全可靠；其以低压直流马达驱动、简单齿轮转动装置带动的升降系统、配合减低嘈音的

箱体，大大减省生产成本，故制成品售价可大大调低，亦较耐用，配合现今的环保潮流。加上，其操作由电路板控制，外壳只需数个功能键即可，外观设计可有更多变化、更加美观，适合家居及饮食业使用。

附图说明

图 1 是现有多士炉内部安全结构分解示意图；

图 2 是现有多士炉内部安全结构组装后示意图；

图 3 是本发明的结构分解示意图；

图 4 是本发明的结构组装后示意图；

图 5 是本发明的电路图。

具体实施方式

以下结合附图和具体实施例详述本发明：

参见图 3 至图 5，本发明包括电路板 12、马达 3、升降架 17 等，马达 3 为一低压直流马达，其透过齿轮组、离合齿轮组及驱动齿条 19 带动升降架 17 升降。电路板 12 上安设变压器 13，将交流电降压，以提供 6 伏特电压的电源，再透过一组二极管整流器转换交流电为直流电，供电给电路板 12 和马达 3。

齿轮组由一连接马达 3 并随其旋转的蜗杆 4 及与其啮合并随其旋转的两个或以上互相啮合的直齿齿轮 5 组成，直齿齿轮 5 其中一边与离合齿轮组啮合。离合齿轮组由一传动轴 10 及装配其上的离合直齿齿轮 11、离合弹簧 9 和两个或以上互相啮合的离合齿轮 7、8 组成，离合齿轮 7 其中一边与直齿齿轮 5 啮合，离合直齿齿轮 11 其中一边与驱动齿条 19 啮合。当马达 3 旋转时，齿轮组带动其中一个离合齿轮 7 转动，离合弹簧 9 的张力把转动中的离合齿轮 7 推贴第二个离合齿轮 8 并带动其转动，第二个离合齿轮 8 通过传动轴 10 带动直齿齿轮 11 转动，直齿齿轮 11 带动驱动齿条 19 上下移动。升降架 17 一侧连接多士炉槽位内的面包支承架，另一侧与驱动齿条 19 固接，驱动齿条 19 升降，带动升降架 17 随着升降，升降架 17 带动面包支承架上的片状面包随着升降。当升降架 17 发生故障卡死，驱动齿条 19 不能上升或下降，直齿齿轮 11 和第二个离合齿轮 8 因此不能顺滑转动，当第一个离合齿轮 7 被马达 3 及齿轮组带动转动时，第一个离合齿轮 7 便会压缩离合弹簧 9，离开第二个离合齿轮 8，第一个离合齿轮 7 与第二个离合齿轮 8 在接合处打滑，从而释放马达 3 旋转时产生的传动力。

升降架 17 对应上感应器 15 及下感应器 16 的位置设掣柄 18；当升降架 17 上升至对应上感应器 15 的水平线位置，掣柄 18 会触动上感应器 15，上感

应器 15 会实时发出电信号至电路板 12，电路板 12 集成电路预设程序控制马达 3 停止旋转，停止升降架 17 继续上升；当升降架 17 下降至对应下感应器 16 的水平线位置，掣柄 18 会触动下感应器 16，下感应器 16 会实时发出电信号至电路板 12，电路板 12 集成电路预设程序控制马达 3 停止旋转，停止升降架 17 继续下降。

电路板 12 的集成电路预设定时程序，在预设时间 10 秒结束后，即自动截断马达 3 的电源，避免马达 3 继续旋转，以防止马达 3 或其它构件发生故障。

发热线的电源采用继电器 14 作为开关，继电器 14 分别电连接电源、电路板 12 及发热线，为电路板 12 集成电路预设程序操作及控制；当完成预设程序，即自动截断继电器 14 电源，继电器 14 随即截断发热线的电源；当升降架 17 下降程序发生故障，下感应器 16 不会发出电信号至电路板 12，电路板 12 不会供电至继电器 14，继电器 14 不会开啓发热线，避免升降架 17 或马达 3 发生故障，面包卡在槽位内不能升起而有机会造成火灾的危险。

电路板 12 预设一组特别设计的电路，控制当电路板 12 计时或电路程序出错或异常或烧坏时，立即发出指令截断发热线的电源，避免多士炉长期通电而有机会造成火灾的危险。

马达 3、齿轮组及离合齿轮组藏于一大致封闭的箱体 1, 2 内，箱体 1, 2 放置在电路板 12 一面，箱体 1, 2 封闭马达 3、齿轮组及离合齿轮组转动时发出的声响，达致减低嘈音的功能。

齿轮组、离合齿轮组及驱动齿条 19 可添加润滑油脂等减少转动时齿轮之间的摩擦，达致减低嘈音及齿转耗损的功能。

使用安装本发明的多士炉时，插上插头，经过变压器 13 降压，再透过一组二极管整流器转换交流电为直流电，供电给电路板 12。将片状面包放进槽位面包支承架，开启多士炉，电路板 12 接收指令，向马达 3 发出时限为 10 秒的“下降信号”。马达 3 朝一方向开始旋转，带动蜗杆 4 旋转，蜗杆 4 带动直齿齿轮 5 旋转，直齿齿轮 5 带动离合齿轮组旋转，离合齿轮组通过离合直齿齿轮 11 带动驱动齿条 19 下降，驱动齿条 19 下降带动升降架 17 及面包支承架下降，直至下感应器 16 感应到升降架 17 的掣柄 18，下感应器 16 实时发出“完成下降信号”至电路板 12，电路板 12 截断马达 3 的电源，马达 3 停止旋转，停止升降架 17 继续下降，电路板 12 随即发出“开始烘烤信号”，全程时间约需 3 秒。若 10 秒后电路板 12 仍未收到下感应器 16 的信号，电路板 12 亦会自行截断马达 3 的电源，不会发出“开始烘烤信号”。

当电路板 12 发出“开始烘烤信号”，指令继电器 14 接通电源供电给发热线发热，烘烤面包，此时电路板 12 会开始计时，预设时间结束，电路板 12 便发出“完成烘烤信号”，切断继电器 14 的电源，继电器 14 随即截断发热线的电源，发热线停止发热，电路板 12 随即发出时限为 10 秒的“上升信号”。马达 3 开始朝反方向旋转，带动蜗杆 4 反向旋转，蜗杆 4 带动直齿齿轮 5 反向旋转，直齿齿轮 5 带动离合齿轮组反向旋转，离合齿轮组通过离合直齿齿轮 11 带动驱动齿条 19 上升，驱动齿条 19 上升带动升降架 17 及面包支承架上升，直至上感应器 15 感应到升降架 17 的掣柄 18，上感应器 15 实时发出“完成上升信号”至电路板 12，电路板 12 截断马达 3 的电源，马达 3 停止旋转，停止升降架 17 继续上升。若 10 秒后电路板 12 仍未收到上感应器 15 的信号，电路板 12 亦会自行截断马达 3 的电源。

权 利 要 求

1、一种多士炉内部安全结构，包括一电路板、一马达、一升降架等，其特征在于：所述马达为一低压直流马达，所述马达透过齿轮组、离合齿轮组及驱动齿条带动所述升降架升降；所述电路板上安设上感应器及下感应器，感应所述升降架升降水平；所述电路板上安设集成电路，利用独有技术软件，预设操作及控制程序；所述电路板上安设变压器，将交流电降压，再透过一组二极管整流器转换交流电为直流电，供电给所述电路板及所述马达。

2、如权利要求1所述的多士炉内部安全结构，其特征在于：所述齿轮组由一连接所述马达并随其旋转的蜗杆及与其啮合并随其旋转的两个或以上互相啮合的直齿齿轮组成，所述直齿齿轮其中一边与所述离合齿轮组啮合。

3、如权利要求1或2所述的多士炉内部安全结构，其特征在于：所述离合齿轮组由一传动轴及装配其上的离合直齿齿轮、离合弹簧和两个或以上互相啮合的离合齿轮组成，所述离合齿轮其中一边与所述直齿齿轮啮合，所述离合直齿齿轮其中一边与所述驱动齿条啮合。当所述马达旋转时，所述齿轮组带动其中一个所述离合齿轮转动，所述离合弹簧的张力把转动中的所述离合齿轮推贴第二个所述离合齿轮带动其转动，第二个所述离合齿轮通过所述传动轴带动所述离合直齿齿轮转动，所述离合直齿齿轮带动所述驱动齿条上下移动。当所述升降架发生故障卡死，所述驱动齿条不能上升或下降，所述离合直齿齿轮和第二个所述离合齿轮因此不能顺滑转动，当第一个所述离合齿轮被所述马达及所述齿轮组带动转动时，第一个所述离合齿轮会压缩所述离合弹簧，离开第二个所述离合齿轮，第一个所述离合齿轮与第二个所述离合齿轮在接合处打滑，从而释放所述马达旋转时产生的传动力。

4、如权利要求1所述的多士炉内部安全结构，其特征在于：所述驱动齿条与所述升降架固接。

5、如权利要求1所述的多士炉内部安全结构，其特征在于：所述升降架对应所述上感应器及所述下感应器的位置设掣柄；当所述升降架上升至对应所述上感应器的水平线位置，所述掣柄会触动所述上感应器，所述上感应器会实时发出电信号至所述电路板，所述电路板集成电路预设程序控制所述马达停止旋转，停止所述升降架继续上升；当所述升降架下降至对应所述下感应器的水平线位置，所述掣柄会触动所述下感应器，所述下感应器会实时发出电信号至所述电路板，所述电路板集成电路预设程序控制所述马达停止旋转，停止所述升

降架继续下降。

6、如权利要求 1 或 4 所述的多士炉内部安全结构，其特征在于：所述升降架一侧连接多士炉槽位内的面包支承架，另一侧连接所述驱动齿条，所述驱动齿条升降，带动所述升降架随着升降，所述升降架带动所述面包支承架上的片状面包随着升降。

7、如权利要求 1 所述的多士炉内部安全结构，其特征在于：所述电路板的集成电路，利用独有技术软件，预设定时程序，在预设时间结束后，即自动截断所述马达的电源，避免所述马达继续旋转，预设时间为每次 5 至 30 秒。

8、如权利要求 1 所述的多士炉内部安全结构，其特征在于：所述发热线的电源采用继电器作为开关，所述继电器分别电连接电源、所述电路板及所述发热线，为所述电路板集成电路预设程序操作及控制；当完成预设程序，即自动截断所述继电器电源，继电器随即截断所述发热线的电源；当所述升降架下降程序发生故障，所述下感应器不会发出电信号至所述电路板，所述电路板不会供电至所述继电器，所述继电器不会开啓所述发热线。

9、如权利要求 1 所述的多士炉内部安全结构，其特征在于：所述电路板预设一组特别设计的电路，控制当所述电路板计时或电路程序出错或异常或烧坏时，立即发出指令截断发热线的电源。

10、如权利要求 1 或 2 所述的多士炉内部安全结构，其特征在于：所述马达、所述齿轮组及所述离合齿轮组藏于一大致封闭的盒体内，所述箱体放置在所述电路板一面，所述箱体封闭所述马达、所述齿轮组及所述离合齿轮组转动时发出的声响。

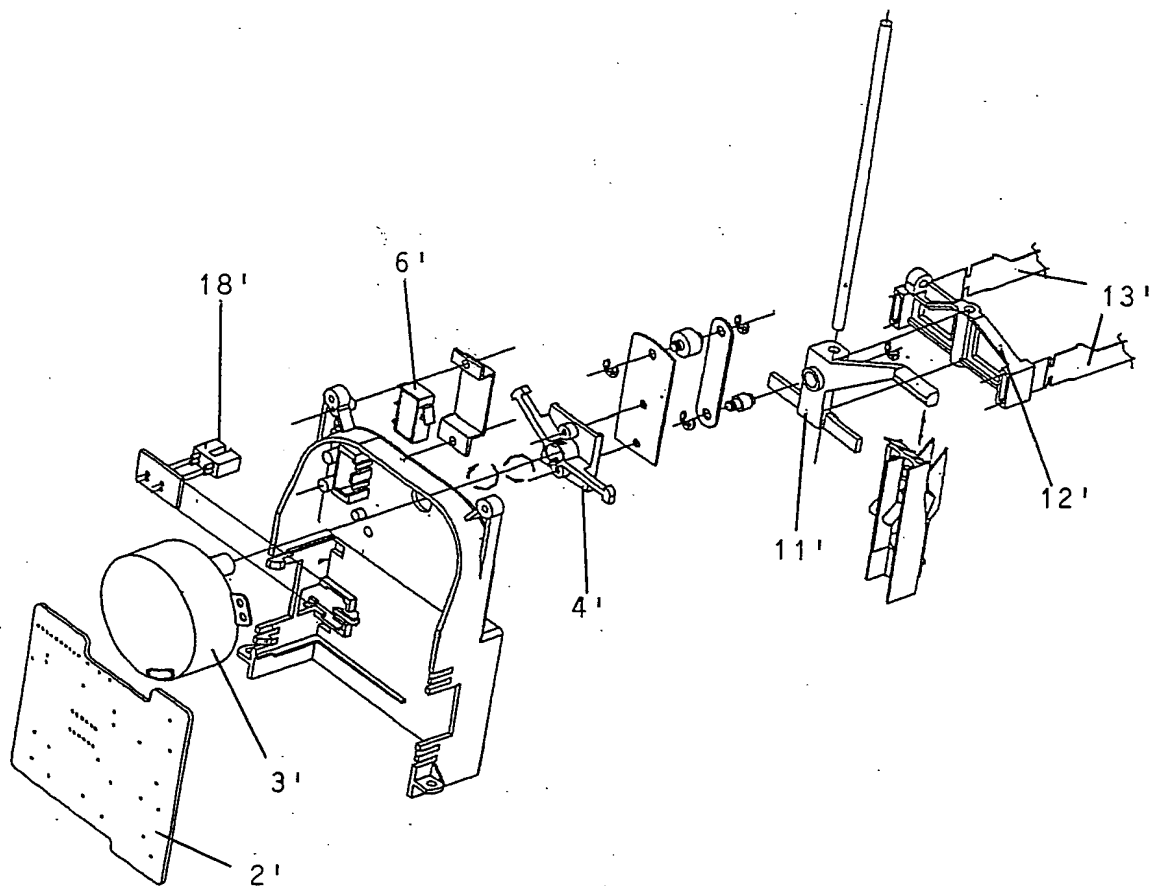


图 1

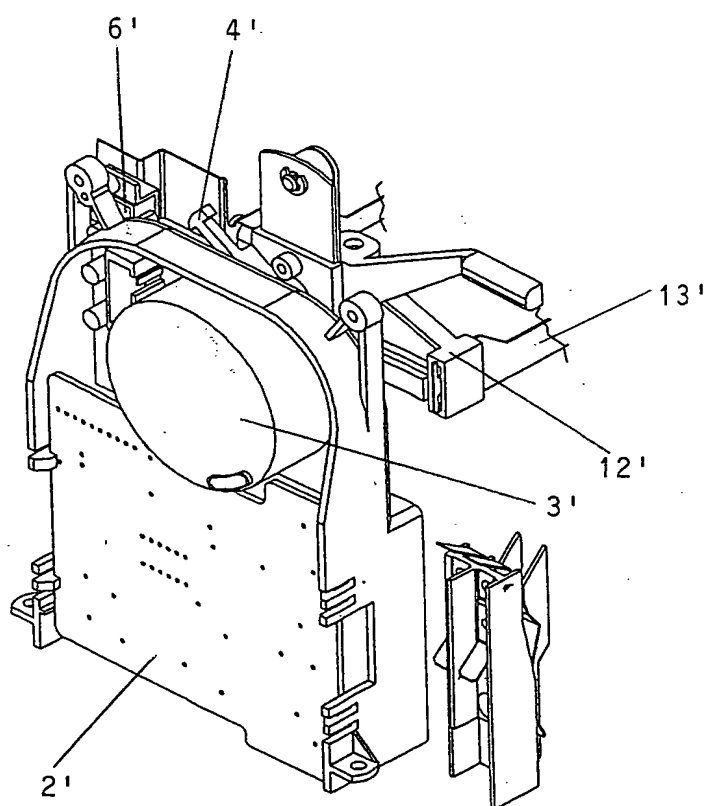


图 2

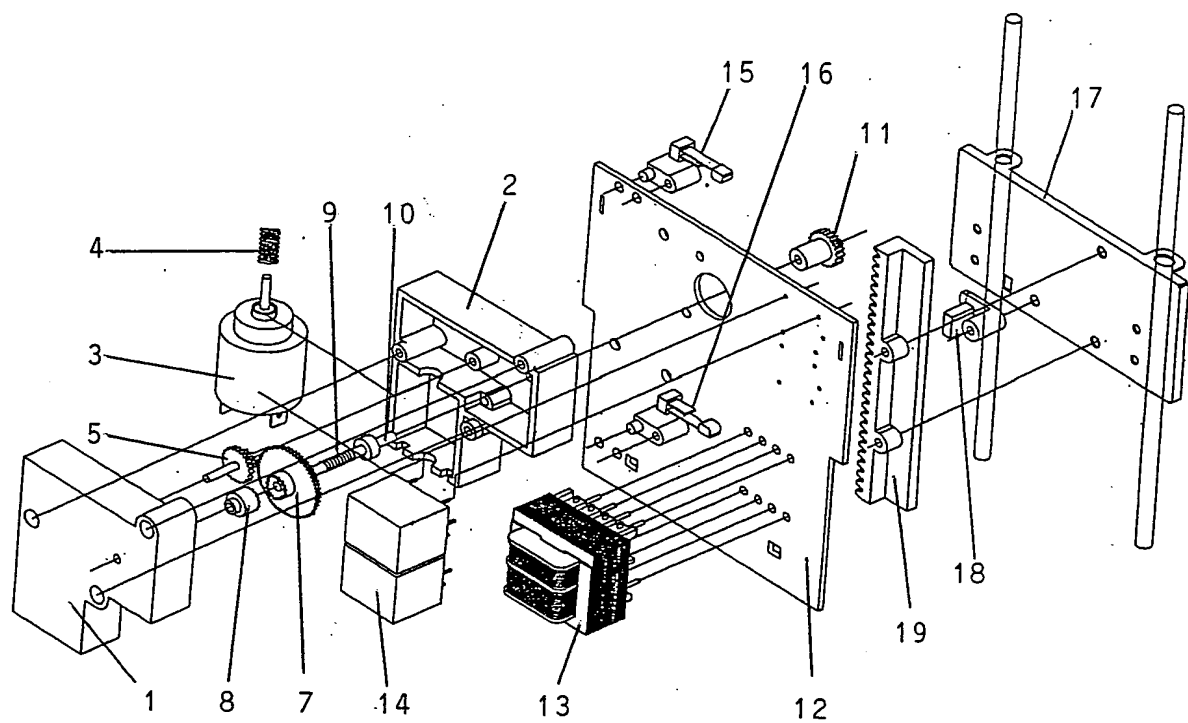


图 3

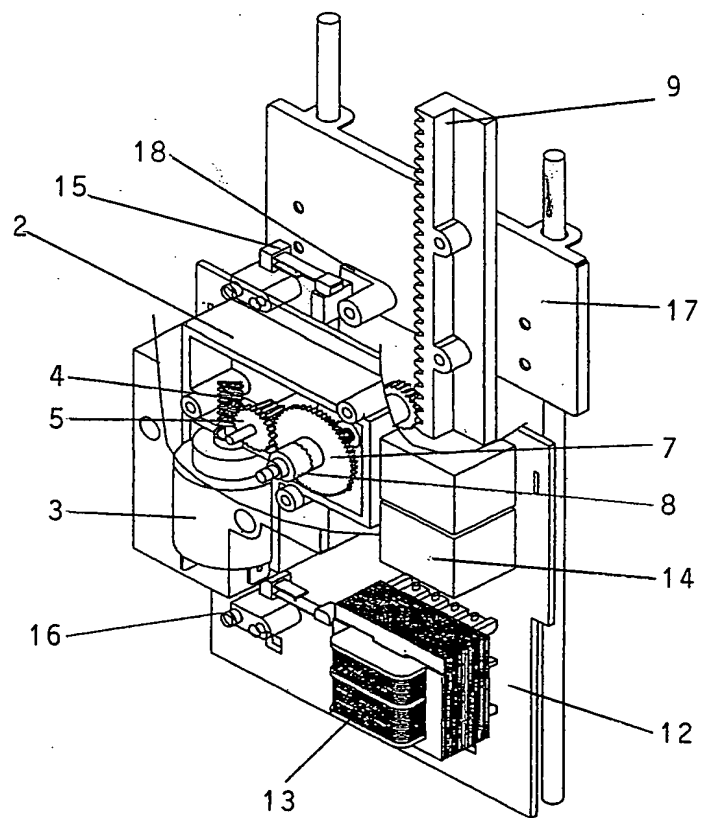


图 4

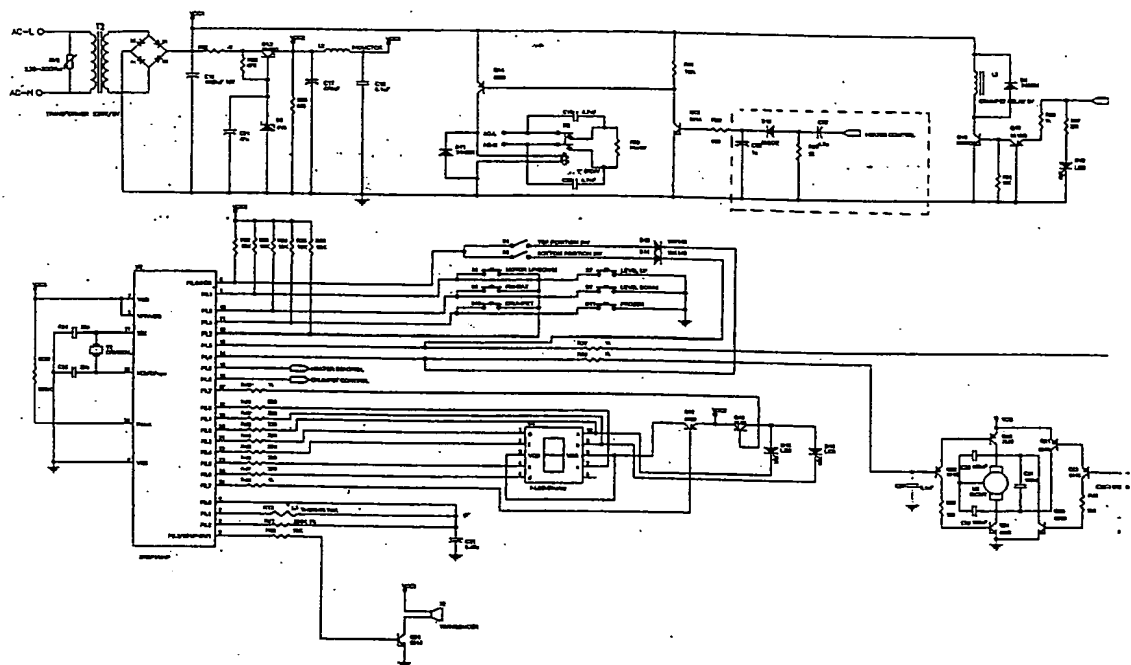


图 5

撮 录

多士炉内部安全结构

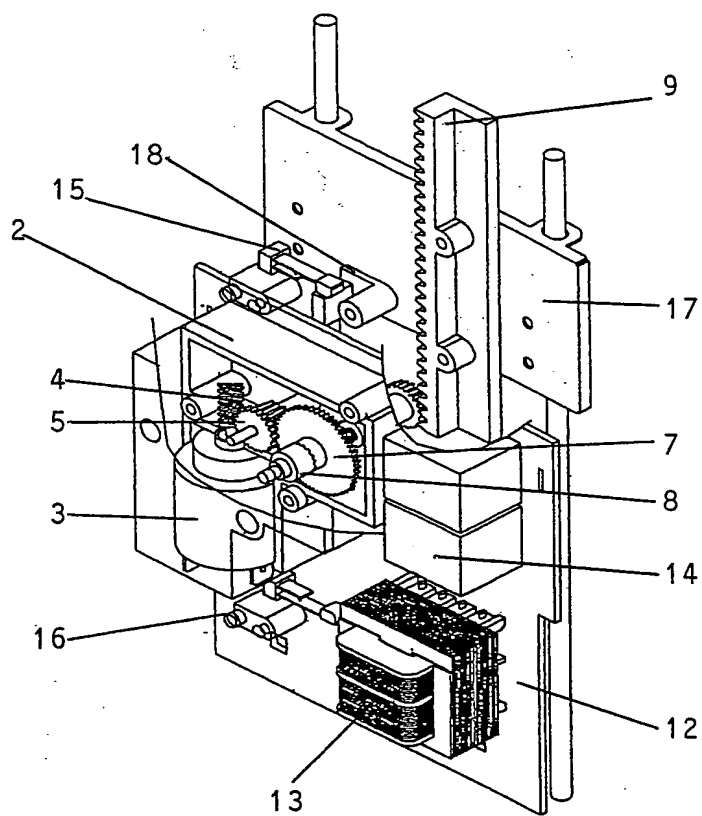
本发明公开一种多士炉内部安全结构，包括一电路板(12)、一马达(3)、一升降架(17)等，马达(3)为一低压直流马达，透过齿轮组、离合齿轮组及驱动齿条(19)带动升降架(17)升降；电路板(12)上安设上感应器(15)及下感应器(16)，感应升降架(17)升降水平，并安设变压器(13)，将交流电降压，再透过一组二极管整流器转换交流电为直流电，供电给电路板(12)及马达(3)。本发明具有安全可靠、生产成本低廉、耗电量低、经济耐用及噪音较低等优良。

Abstract

An internal safety structure for toasters

The present invention discloses an internal safety structure for toasters comprising a circuit board (12), a motor (3), a lifting rack (17) and others. The motor (3) is a low voltage direct current motor driving the lifting rack (17) to move upwards or downwards through a set of gears, a set of clutch gears and a driving gear bar (19). On the circuit board (12), an upper sensor (15) and a lower sensor (16) are installed to sense the lifting level of the lifting rack (17), and a transformer (13) is installed to reduce the voltage of alternating current of power to the circuit board (12) and the motor (3) through a set of diode rectifiers changing alternating current to direct current. The present invention is of simple and reliable construction, susceptible of low production costs and consumes low energy. It is economical and durable and produces less noise.

摄 录 附 图



IN THE MATTER OF Oaths
and Declaration Ordinance
(Cap. 11)

STATUTORY DECLARATION
OF
CHOW KA YAN

EXHIBIT B

This is Exhibit B to the Statutory Declaration of CHOW KA YAN declared before
me this 27th day of February, 2004.

Before me,



Jo S.Y. Chan
Solicitor
Hong Kong SAR

INTELLECTUAL PROPERTY DEPARTMENT

Patents Form P6
Version 2002
Fee No. 6

Patents Ordinance
(Chapter 514)

For Official Use

Date of receipt

Application No.

03107911.8

Accorded filing date

3 NOV 2003

Request for Grant of a Short-Term Patent

Patents Ordinance sections 113, 116, 125
Patents (General) Rules sections 58, 74

(See the notes on the last page of this form)

01	Your reference	4464/YW/005
02	Applicant's details (see note (4)(a)) Name (underline surname) Name in Chinese (if applicable) Address Telephone Fax Kind of incorporation Country of incorporation State of incorporation (if applicable)	Yorkwell Industries Limited 旭和實業有限公司 Unit 6, 19/F., Seapower Centre, 73-77 Lei Muk Road, Kwai Chung, N.T., Hong Kong A limited liability company Hong Kong
03	Title of invention (see note (4)(b))	English An internal safety structure for toasters Chinese 多士爐內部安全結構

04 Details of International Patent Classification (see note (5))	IPC Code A 47 J		IPC Edition No. 7
05 Use of micro-organisms (tick the appropriate box) <p>(a) Does the invention require the use of a micro-organism for its performance?</p> <p>(b) If you have ticked "Yes", please indicate whether the micro-organism is available to the public at the date of filing of the application; and</p> <p>whether the micro-organism is described in the application or the specification of the patent in such a manner as to enable the invention to be performed by a person skilled in the art.</p> <p>(c) If you have ticked "No" in both boxes in (b), please give the following details:</p> <p>Name and address of the depositary institution where a culture of the micro-organism is deposited</p> <p>Date of deposit (Day/Month/Year)</p> <p>Accession No. of the deposit (section 73 and Schedule 1, Patents (General) Rules)</p>	<div> <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No </div> <hr/> <div> <input type="checkbox"/> Yes <input type="checkbox"/> No </div> <hr/> <div> <input type="checkbox"/> Yes <input type="checkbox"/> No </div> <hr/> <p>Name:</p> <p>Address:</p> <hr/> <hr/> <hr/>		
06 Details of international application If the short-term patent application is based on <p>(a) International Application No.</p> <p>(b) International Filing Date (Day/Month/Year)</p> <p>(c) International Publication No.</p> <p>(d) International Publication Date (Day/Month/Year)</p> <p>(e) Date of entry into the national phase in the People's Republic of China</p> <p>or</p> <p>Date of issuance of the National Application Notification by the State Intellectual Property Office</p> <p>(tick the appropriate box and enter the date in the space provided)</p>	<hr/> <hr/> <hr/> <hr/> <div> <input type="checkbox"/> _____ (Day/Month/Year) </div> <p>or</p> <div> <input type="checkbox"/> _____ (Day/Month/Year) </div>		

<p>(f) Application No. of the Chinese patent application (if known)</p> <p><i>(section 125, Patents Ordinance and section 78, Patents (General) Rules)</i></p>			
<p>07 Details of earlier application If the application is divided or derived from an earlier Hong Kong application</p> <p>(a) Section under which an earlier application is claimed <i>(see note (6))</i> <i>(tick the appropriate box)</i></p> <p>(b) Earlier Application No.</p> <p>(c) Earlier Application Filing Date <i>(Day/Month/Year)</i></p>	<p style="text-align: center;">Patents Ordinance</p> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;"> <input type="checkbox"/> section 116 </div> <div style="text-align: center;"> <input type="checkbox"/> section 55 </div> </div>		
<p>08 Details of the priority application If a statement of claim of priority under section 111, Patents Ordinance is made <i>(sections 58(5)(c), 69, Patents (General) Rules)</i></p>	<p>Statement</p> <p style="text-align: center;">No Claims.</p>		
	<p style="text-align: center;">Country</p>	<p style="text-align: center;">Priority Application No.</p>	<p style="text-align: center;">Priority Application Filing Date</p>
<p>09 Details of inventor <i>(see note (4)(a))</i> <i>(see note (7))</i></p> <p style="text-align: right;">Name <i>(underline surname)</i></p> <p style="text-align: right;">Name in Chinese <i>(if applicable)</i></p> <p style="text-align: right;">Address</p>	<p><u>WONG KWOK PING</u></p> <p><u>王國平</u></p> <p>Unit 6, 19/F., Seapower Centre, 73-77 Lei Muk Road, Kwai Chung, N.T., Hong Kong</p>		
<p>10 Non-prejudicial disclosure If the applicant is making a claim regarding non-prejudicial disclosure under section 109, Patents Ordinance, please provide a statement giving details relating to such disclosure. <i>(see note (8))</i></p>	<p>Statement</p> <p style="text-align: center;">No claims.</p>		
	<p style="text-align: center;">Name and place of the exhibition or meeting</p>	<p style="text-align: center;">Opening date of the exhibition or meeting</p>	<p style="text-align: center;">Date of first disclosure</p>

11 If a request for deferral of grant under section 119, Patents Ordinance is required, please tick the box and enter the period of such deferral. <i>(the period of deferral should not exceed 12 months)</i> <i>(if the box is not ticked, it will be taken that deferral of grant is not requested)</i>	<input type="checkbox"/> Request for deferral of grant up to _____ <div style="text-align: right;"><i>(Day/Month/Year)</i></div>																
12 Enter the no. of sheets for any of the following documents you are filing with this form (a) Continuation sheet for the request (b) Description (c) Claim(s) (d) Drawing(s) (e) Abstract <i>(in both English and Chinese)</i> (f) Priority document(s) (g) Translation of the priority document(s) (h) Search Report (i) Translation of the Search Report (j) In the case of an international application, copy of : (i) the international application as published by the International Bureau (ii) the international search report (iii) translation as published by the State Intellectual Property Office (iv) publication of information by the State Intellectual Property Office concerning the international application (k) Statement of inventorship on Patents Form P7 in accordance with section 113(2)(c), Patents Ordinance and section 65, Patents (General) Rules <i>(see note (7))</i> (l) Others <i>(please specify)</i>	<table border="1"> <thead> <tr> <th data-bbox="748 373 1073 499">No. of sheets</th> </tr> </thead> <tbody> <tr> <td data-bbox="1073 499 1572 562">0</td> </tr> <tr> <td data-bbox="1073 562 1572 625">7</td> </tr> <tr> <td data-bbox="1073 625 1572 688">2</td> </tr> <tr> <td data-bbox="1073 688 1572 751">5</td> </tr> <tr> <td data-bbox="1073 751 1572 814">1+1</td> </tr> <tr> <td data-bbox="1073 814 1572 877">0</td> </tr> <tr> <td data-bbox="1073 877 1572 940">0</td> </tr> <tr> <td data-bbox="1073 940 1572 1003">0 (To be provided later)</td> </tr> <tr> <td data-bbox="1073 1003 1572 1066">0</td> </tr> <tr> <td data-bbox="1073 1066 1572 1255">0</td> </tr> <tr> <td data-bbox="1073 1255 1572 1318">0</td> </tr> <tr> <td data-bbox="1073 1318 1572 1423">0</td> </tr> <tr> <td data-bbox="1073 1423 1572 1549">0</td> </tr> <tr> <td data-bbox="1073 1549 1572 1738">2</td> </tr> <tr> <td data-bbox="1073 1738 1572 1917">0</td> </tr> </tbody> </table>	No. of sheets	0	7	2	5	1+1	0	0	0 (To be provided later)	0	0	0	0	0	2	0
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<p>13 Name of agent <i>(if you have one)</i></p> <p>Address for service in Hong Kong</p> <p>Telephone</p> <p>Fax</p> <p>Agent's code <i>(if known)</i></p>	<p>China.hk Intellectual Property Services Co., Ltd.</p> <p>2504-6, 25/F, CC Wu Building, 302-308 Hennessy Road, Hong Kong</p> <p>2110 9608</p> <p>2110 9620</p>
<p>14 I/We request the Registrar to grant a short-term patent.</p> <p>Signature</p> <p>Name of signatory</p> <p>Official capacity of signatory</p> <p>Date <i>(Day/Month/Year)</i></p>	<p>CHAN YEE HANG</p> <p>DIRECTOR</p> <p>03/11/2003</p>

DESCRIPTION

AN INTERNAL SAFETY STRUCTURE FOR TOASTERS

TECHNICAL FIELD

The present invention relates to an internal safety structure for toasters and more particularly pertains to an internal structure for toasters which is driven by a low voltage direct current motor. It is under the field of circuit protection device.

BACKGROUND OF THE INVENTION

Toasters have become the necessities for families, cafeterias and restaurants for a long time. The basic internal structure of a conventional two-slice toaster available in the marketplace has three mica sheets which are wrapped in nichrome wire as heating wire and are spaced parallel to each other to form two slots. The width of each slot is approximately 36mm, which is just fit for inserting a slice of bread. A holder is placed inside the slot to hold the bread slice. One end of the holder connects to one surface of a lifting rack. The other surface of the lifting rack has an insulating bar and a metal piece on it. The lifting rack connects to an exposed handle. A circuit board is disposed in a position corresponding to the insulating bar and the metal piece and on which an electromagnet, capacitors, resistors, transistors, bipolar electric contacts, electric conducting metal strips, an electric wire connected to a plug and so forth are installed. To use the toaster, the user inserts the plug to a power socket and inserts a slice of bread into each slot. The user then presses down the handle to drive the lifting rack to slide downwards to the bottom of the toaster. By so doing, the holder is driven downwards simultaneously. The insulating bar on the lifting rack is driven downwards to push the electric conducting metal strips apart to press against the bipolar electric contacts and thus the circuit is connected to supply

power to the electromagnet. The electromagnet then generates magnetic force to attract the metal piece so that the holder stays in the bottom of the toaster. After the circuit is connected, the heating wire is heated up and emits infrared radiation to heat up and dry the slices of bread. The capacitors and the resistors on the circuit board function together as a timer. When the capacitor stores electrical charge up to a certain level and a certain level of power supply voltage is reached, it automatically cuts off the power supply to the electromagnet. The magnetic force then disappears and the lifting rack is pulled upwards by a spring above. The lifting rack brings the holder to rise simultaneously and thus the slices of bread pops out. When the lifting rack rises, the insulating bar moves upwards and is detached from the electric conducting metal strips, thereby cutting off the circuit to stop the heating wire from heating continuously.

Toasters available in the marketplace operate with high voltage alternating current such as 110V in the United States and 220V to 250V in European and Asian countries. If the handle or the lifting rack or the holder fails to move upwards or downwards and the power supply cannot be cut off in time, it may burn the bread or even the toaster and in serious cases, it may cause fire resulting in loss of valuables and even human lives and so it is dangerous.

There are toasters in the marketplace which are equipped with safer internal structure. As illustrated in FIG. 1 and 2 which show the internal structure of such a toaster, the toaster is constructed in a manner that no handle is used. The construction of the toaster is to use a motor together with a circuit board to control the operation of different components, the main structure of which comprises a circuit board 2', a motor 3', a lifting rack driving latch 4', a limit switch 6', a heating wire driving latch 11', a lifting rack 12', a holder 13' and so forth. To use the toaster,

the user inserts the plug to a power socket. The capacitors on the circuit board limit the electric current and reduce the voltage to supply power to the circuit board 2' and the motor 3'. The user then inserts the slices of bread into the holder 13' and the photoelectric switch 18' is switched on automatically. The circuit board 2' then gives instructions, and the motor 3' immediately drives the lifting rack driving latch 4' to rotate anti-clockwise, thereby driving the lifting rack 12' as well as the holder 13' to descend simultaneously. The motor 3' and the lifting rack driving latch 4' continue to rotate until the limit switch 6' is contacted and they stop rotating. When the lifting rack 12' descends, the heating wire driving latch 11' descends simultaneously, thereby turning on the heating wire switch and causing the heating wire to heat up and send electrical signals to the circuit board 2'. On the circuit board 2', there is an integrated circuit having timer function which starts to count the time. Upon expiration of the preset time, the circuit board 2' gives instructions, the motor 3' then immediately drives the lifting rack driving latch 4' to rotate anti-clockwise and drives the lifting rack 12' as well as the holder 13' to ascend simultaneously. The motor 3' and the lifting rack driving latch 4' continue to rotate anti-clockwise until the limit switch 6' is contacted and they stop rotating. When the lifting rack 12' ascends, the heating wire driving latch 11' ascends simultaneously and is detached from the heating wire switch, thereby cutting off the power supply to stop the heating wire from heating continuously.

Toasters with the aforesaid internal structure do not suffer from malfunctions of the handle or the lifting rack and so they are safer than typical toasters. However, the components of such toasters are operated by the high voltage alternating current motors. Noise produced is relatively loud. If the motor is out of order or overloaded, or if the capacitors are out of order, the power supply may not be cut off in time,

causing a long period of overheating of the heating wire. The bread and the toaster may be burnt, and fires may be resulted causing loss of valuables or even human lives.

Therefore, the internal structure of the toasters available in the marketplace still cannot meet the requirements of consumers.

BRIEF SUMMARY OF THE INVENTION

In view of the aforesaid disadvantages now present in the prior art, the main objective of the present invention is to provide an internal safety structure for toasters which is driven by a low voltage direct current motor. It is of simple and reliable construction and is susceptible of low production costs. It consumes low energy. It is economical and durable and produces less noise.

To achieve the aforementioned objectives, the present invention adopts the following features:

An internal safety structure for toasters comprising a circuit board, a motor, a lifting rack and other components, which is characterized in that the motor is a low voltage direct current motor which drives the lifting rack to move upwards or downwards through a set of gears, a set of clutch gears and a driving gear bar; on the circuit board, an upper sensor and a lower sensor are installed to sense the lifting level of the lifting rack; on the circuit board, there is an integrated circuit which contains custom software to preset the operation and control programs; on the circuit board, a transformer is installed to reduce the voltage of the alternating current, which supplies power to the circuit board and the motor through a set of diode rectifiers changing the alternating current to direct current.

The internal safety structure for toasters which is characterized in that the set of gears comprises an endless screw which connects and rotates with the motor, and

two or more straight-tooth gears which are intermeshed with one another and mesh and rotate with the motor. One side of the straight-tooth gears meshes with one side of the set of clutch gears.

The internal safety structure for toasters which is characterized in that the set of clutch gears comprises a transmission shaft and a clutch straight-tooth gear, a clutch spring and two or more intermeshed clutch gears which are installed on the transmission shaft. One side of the clutch gears meshes with the straight-tooth gear. One side of the clutch straight-tooth gear meshes with the driving gear bar. When the motor rotates, the set of gears drives one clutch gear in the set of clutch gears to rotate. The rotating clutch gear is pushed by the tension which is created by the clutch spring towards the second clutch gear and drives it to rotate. The second clutch gear drives the clutch straight-tooth gear to rotate through the transmission shaft. The clutch straight-tooth gear drives the driving gear bar to move upwards or downwards. When the lifting rack is out of order and becomes immovable, the driving gear bar cannot move upwards or downwards and so the clutch straight-tooth gear and the second clutch gear cannot rotate smoothly. When the first clutch gear is driven to rotate by the motor and the set of gears, the first clutch gear compresses the clutch spring and moves away from the second clutch gear. The first clutch gear and the second clutch gear skid at the point of contact, thus releasing the driving force generated by the rotation of the motor.

The internal safety structure for toasters which is characterized in that the driving gear bar is connected to the lifting rack securely. The teeth on one side of the driving gear bar mesh with one side of the clutch straight-tooth gear.

The internal safety structure for toasters which is characterized in that the lifting rack has a latch disposed in a position corresponding to the upper sensor and the

lower sensor. When the lifting rack ascends to a horizontal position corresponding to that of the upper sensor, the latch contacts the upper sensor and the upper sensor immediately sends electrical signals to the circuit board. The preset programs of the integrated circuit of the circuit board control the motor to stop rotating. The lifting rack is then stopped from ascending continuously. When the lifting rack descends to a horizontal position corresponding to that of the lower sensor, the latch contacts the lower sensor and the lower sensor then immediately sends electrical signals to the circuit board. The preset programs of the integrated circuit of the circuit board control the motor to stop rotating. The lifting rack is then stopped from descending continuously.

The internal safety structure for toasters which is characterized in that one side of the lifting rack connects to a holder placed inside the toaster slots and the other side is connected to the driving gear bar. The upward or downward movements of the driving gear bar drive the lifting rack to move upwards or downwards accordingly. The lifting rack drives the slices of bread on the holder to move upwards or downwards accordingly.

The internal safety structure for toasters which is characterized in that the integrated circuit of the circuit board contains custom software to preset timing for the programs. It automatically cuts off the power supply to the motor after the expiration of the preset time limit, so as to stop the motor from rotating continuously, thus preventing the motor or other components from malfunctioning. The preset time limit is 5 to 30 seconds.

The internal safety structure for toasters which is characterized in that the power supply of the heating wire uses a relay as a switch. The relay is electrically connected to the power source, the circuit board and the heating wire respectively,

and is operated and controlled by the preset programs of the integrated circuit of the circuit board. Upon completion of the preset programs, the power supply to the relay is automatically cut off and the relay immediately cuts off the power supply to the heating wire. When the descending procedure of the lifting rack functions improperly, the lower sensor does not send any electrical signal to the circuit board, and the circuit board does not supply power to the relay and so the relay does not switch on the heating wire. Therefore, malfunctions of the lifting rack or the motor can be avoided. It can also prevent a slice of bread from getting stuck inside the slot and being immovable, thus reducing the possibility of causing a fire.

The internal safety structure for toasters which is characterized in that the circuit board contains a set of specially designed circuits which controls in a manner that when any fault, abnormality or overheating occurs in the timing or circuit programs of the circuit board, the circuit board sends instructions to cut off the power supply to the heating wire, preventing power from being continuously supplied to the toaster, thus causing fires.

The internal safety structure for toasters which is characterized in that the motor, the set of gears and the set of clutch gears are disposed inside a substantially enclosed casing. The casing is placed on one side of the circuit board. The casing encloses the noise generated by the rotation of the motor, the set of gears and the set of clutch gears, thus having the function of reducing the noise.

The internal safety structure for toasters which is characterized in that lubricants can be added to the set of gears, the set of clutch gears and the driving gear bar to reduce the frictions among the gears while rotating, thus having the function of reducing the noise and tear and wear of the gears.

To use the toaster, the user inserts the plug to a power socket. Power is supplied to the circuit board through a transformer to reduce the voltage and a set of diode rectifiers to change alternating current to direct current. The user places a slice of bread into the holder in the slot and switch on the toaster. The circuit board receives instructions and sends a “descending signal” of a preset time limit to the motor. The motor then starts to rotate in one direction and drive the endless screw to rotate. The endless screw drives the straight-tooth gears to rotate. The straight-tooth gears drive the set of clutch gears to rotate. The set of clutch gears drives the driving gear bar to move downwards through the clutch straight-tooth gear. The downward movement of the driving gear bar drives the lifting rack and the holder to move downwards until the lower sensor senses the latch of the lifting rack. The lower sensor then sends a “descending completed signal” to the circuit board immediately. The circuit board cuts off the power supply to the motor, and the motor stops rotating and the lifting rack stops descending. The circuit board then sends a “start-to-toast signal”. If the circuit board does not receive any signal from the lower sensor within the preset time limit, the circuit board will automatically cut off the power supply to the motor and will not send any “start-to-toast signal”.

When the circuit board sends a “start-to-toast signal”, the relay is instructed to supply power to the heating wire to heating up and then to toast the slice of bread and at this point of time, the circuit board starts to count the time. Upon expiration of the preset time, the circuit board sends a “toasting completed signal” and cuts off the power supply to the relay and the relay immediately cuts off the power supply to the heating wire, thus preventing the heating wire from heating continuously. The circuit board then sends an “ascending signal” of a preset time limit immediately. The motor starts to rotate in reverse direction and drives the endless screw to rotate in reverse

direction. The endless screw then drives the straight-tooth gears to rotate in reverse direction. The straight-tooth gears drive the set of clutch gears to rotate in reverse direction. The set of clutch gears drives the driving gear bar to move upwards through the clutch straight-tooth gear. The upward movement of the driving gear bar drives the lifting rack and the holder to move upwards until the upper sensor senses the latch of the lifting rack. The upper sensor then immediately sends an "ascending completed signal" to the circuit board. The circuit board then cuts off the power supply to the motor, and the motor stops rotating and the lifting rack stops ascending. If the circuit board does not receive any signal from the upper sensor within the preset time limit, the circuit board will automatically cut off the power supply to the motor.

With the aforementioned features, the present invention has multiple automatic power cut-off devices and is safe and reliable. The usage of a low voltage direct current motor as driving force, a lifting system driven by simple gear transmission mechanism and a noise reducing casing significantly lowers the production costs and reduces the selling price of the final product. The final product is of higher durability which suits the current trend of environmental protection. Moreover, the operation of the present invention is controlled by a circuit board, thus requiring only a few function keys on the casing of the toaster, and so the outlook design is susceptible of more variations and higher aesthetic value. The present invention is suitable for use in family or in the food catering industry.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is the dismantling view of the internal safety structure of a conventional toaster.

FIG. 2 is the perspective view of the internal safety structure of a conventional toaster.

FIG. 3 is the dismantling view of the present invention.

FIG. 4 is the perspective view of the present invention.

FIG. 5 is the circuit diagram of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

As illustrated in FIGS. 3 to 5, the present invention generally comprises a circuit board 12, a motor 3, a lifting rack 17 and other components. The motor 3 is a low voltage direct current motor which drives the lifting rack 17 to move upwards or downwards through a set of gears, a set of clutch gears and a driving gear bar 19. On the circuit board 12, a transformer 13 is installed to reduce the voltage of the alternating current to supply 6V power, and power is supplied to the circuit board 12 and the motor 3 through a set of diode rectifiers changing the alternating current to direct current.

The set of gears comprises an endless screw 4 which connects and rotates with the motor 3, and two or more straight-tooth gears 5 which are intermeshed with one another and mesh and rotate with the motor 3. One side of the straight-tooth gears 5 meshes with one side of the set of clutch gears. The set of clutch gears comprises a transmission shaft 10 and a clutch straight-tooth gear 11, a clutch spring 9 and two or more intermeshed clutch gears 7, 8 which are installed the transmission shaft 10. One side of the clutch gears 7 meshes with the straight-tooth gear 5. One side of the clutch straight-tooth gear 11 meshes with the driving gear bar 19. When the motor 3 rotates, the set of gears drives one clutch gear 7 in the set of clutch gears to rotate. The rotating clutch gear 7 is pushed by the tension which is created by the clutch spring 9 towards the second clutch gear 8 and drives it to rotate. The

second clutch gear 8 drives the clutch straight-tooth gear 11 to rotate through the transmission shaft 10. The clutch straight-tooth gear 11 drives the driving gear bar 19 to move upwards or downwards. One side of the lifting rack 17 connects to a holder placed inside the toaster slots and the other side is connected to the driving gear bar 19. The upward or downward movements of the driving gear bar 19 drive the lifting rack 17 to move upwards or downwards accordingly. The lifting rack 17 drives the slices of bread on the holder to move upwards or downwards accordingly. When the lifting rack 17 is out of order and becomes immovable, the driving gear bar 19 cannot move upwards or downwards and so the clutch straight-tooth gear 11 and the second clutch gear 8 cannot rotate smoothly. When the first clutch gear 7 is driven to rotate by the motor 3 and the set of gears, the first clutch gear 7 compresses the clutch spring 9 and moves away from the second clutch gear 8. The first clutch gear 7 and the second clutch gear 8 skid at the point of contact, thus releasing the driving force generated by the rotation of the motor 3.

The lifting rack 17 has a latch 18 disposed in a position corresponding to the upper sensor 15 and the lower sensor 16. When the lifting rack 17 ascends to a horizontal position corresponding to that of the upper sensor 15, the latch 18 contacts the upper sensor 15 and the upper sensor 15 immediately sends electrical signals to the circuit board 12. The preset programs of the integrated circuit of the circuit board 12 control the motor 3 to stop rotating. The lifting rack 17 is then stopped from ascending continuously. When the lifting rack 17 descends to a horizontal position corresponding to that of the lower sensor 16, the latch 18 contacts the lower sensor 16 and the lower sensor 16 then immediately sends electrical signals to the circuit board 12. The preset programs of the integrated circuit of the

circuit board 12 control the motor 3 to stop rotating. The lifting rack 17 is then stopped from descending continuously.

The integrated circuit of the circuit board 12 contains custom software to preset timing for the programs. It automatically cuts off the power supply to the motor 3 after the expiration of the preset time limit of 10 seconds, so as to stop the motor 3 from rotating continuously, thus preventing the motor 3 or other components from malfunctioning.

The power supply of the heating wire uses a relay 14 as a switch. The relay 14 is electrically connected to the power source, the circuit board 12 and the heating wire respectively, and is operated and controlled by the preset programs of the integrated circuit of the circuit board 12. Upon completion of the preset programs, the power supply to the relay 14 is automatically cut off and the relay 14 immediately cuts off the power supply to the heating wire. When the descending procedure of the lifting rack 17 functions improperly, the lower sensor 16 does not send any electrical signal to the circuit board 12, and the circuit board 12 does not supply power to the relay 14 and so the relay 14 does not switch on the heating wire. Therefore, malfunctions of the lifting rack 17 or the motor 3 can be avoided. It can also prevent a slice of bread from getting stuck inside the slot and being immovable, thus reducing the possibility of causing a fire.

The circuit board 12 contains a set of specially designed circuits which controls in a manner that when any fault, abnormality or overheating occurs in the timing or circuit programs of the circuit board 12, the circuit board 12 sends instructions to cut off the power supply to the heating wire, preventing power from being continuously supplied to the toaster, thus causing fires.

The motor 3, the set of gears and the set of clutch gears are disposed inside a substantially enclosed casing 1, 2. The casing 1, 2 is placed on one side of the circuit board 12. The casing 1, 2 encloses the noise generated by the rotation of the motor 3, the set of gears and the set of clutch gears, thus having the function of reducing the noise.

Lubricants can be added to the set of gears, the set of clutch gears and the driving gear bar 19 to reduce the frictions among the gears while rotating, thus having the function of reducing the noise and tear and wear of the gears.

To use the toaster, the user inserts the plug to a power socket. Power is supplied to the circuit board 12 through a transformer 13 to reduce the voltage and a set of diode rectifiers to change alternating current to direct current. The user places a slice of bread into the holder in the slot and switch on the toaster. The circuit board 12 receives instructions and sends a “descending signal” of a preset time limit of 10 seconds to the motor 3. The motor 3 then starts to rotate in one direction and drive the endless screw 4 to rotate. The endless screw 4 drives the straight-tooth gears 5 to rotate. The straight-tooth gears 5 drive the set of clutch gears to rotate. The set of clutch gears drives the driving gear bar 19 to move downwards through the clutch straight-tooth gear 11. The downward movement of the driving gear bar 19 drives the lifting rack 17 and the holder to move downwards until the lower sensor 16 senses the latch 18 of the lifting rack 17. The lower sensor 16 then sends a “descending completed signal” to the circuit board 12 immediately. The circuit board 12 cuts off the power supply to the motor 3, and the motor 3 stops rotating and the lifting rack 17 stops descending. The circuit board 12 then sends a “start-to-toast signal”. The whole process takes about 3 seconds. If the circuit board 12 does not receive any signal from the lower sensor 16 within the preset time limit of 10 seconds, the circuit

board 12 will automatically cut off the power supply to the motor 3 and will not send any “start-to-toast signal”.

When the circuit board 12 sends a “start-to-toast signal”, the relay 14 is instructed to supply power to the heating wire to heating up and then to toast the slice of bread and at this point of time, the circuit board 12 starts to count the time. Upon expiration of the preset time, the circuit board 12 sends a “toasting completed signal” and cuts off the power supply to the relay 14 and the relay 14 immediately cuts off the power supply to the heating wire, thus preventing the heating wire from heating continuously. The circuit board 12 then sends an “ascending signal” of a preset time limit of 10 seconds immediately. The motor 3 starts to rotate in reverse direction and drives the endless screw 4 to rotate in reverse direction. The endless screw 4 then drives the straight-tooth gears 5 to rotate in reverse direction. The straight-tooth gears 5 drive the set of clutch gears to rotate in reverse direction. The set of clutch gears drives the driving gear bar 19 to move upwards through the clutch straight-tooth gear 11. The upward movement of the driving gear bar 19 drives the lifting rack 17 and the holder to move upwards until the upper sensor 15 senses the latch 18 of the lifting rack 17. The upper sensor 15 then immediately sends an “ascending completed signal” to the circuit board 12. The circuit board 12 then cuts off the power supply to the motor 3, and the motor 3 stops rotating and the lifting rack 17 stops ascending. If the circuit board 12 does not receive any signal from the upper sensor 15 within the preset time limit of 10 seconds, the circuit board 12 will automatically cut off the power supply to the motor 3.

CLAIMS

1. An internal safety structure for toasters comprising a circuit board, a motor, a lifting rack and other components, which is characterized in that the motor is a low voltage direct current motor which drives the lifting rack to move upwards or downwards through a set of gears, a set of clutch gears and a driving gear bar; on the circuit board, an upper sensor and a lower sensor are installed to sense the lifting level of the lifting rack; on the circuit board, there is an integrated circuit which contains custom software to preset the operation and control programs; on the circuit board, a transformer is installed to reduce the voltage of the alternating current, which supplies power to the circuit board and the motor through a set of diode rectifiers changing the alternating current to direct current.

2. An internal safety structure for toasters as in claim 1, which is characterized in that the set of gears comprises an endless screw which connects and rotates with the motor, and two or more straight-tooth gears which are intermeshed with one another and mesh and rotate with the motor; and one side of the straight-tooth gears meshes with the set of clutch gears.

3. An internal safety structure for toasters as in claim 1 or 2, which is characterized in that the set of clutch gears comprises a transmission shaft and a clutch straight-tooth gear, a clutch spring and two or more intermeshed clutch gears which are installed on the transmission shaft; one side of the clutch gears meshes with the straight-tooth gear; one side of the clutch straight-tooth gear meshes with the driving gear bar; when the motor rotates, the set of gears drives one clutch gear in the set of clutch gears to rotate; the rotating clutch gear is pushed by the tension which is created by the clutch spring towards the second clutch gear and drives it to

rotate; the second clutch gear drives the clutch straight-tooth gear to rotate through the transmission shaft; the clutch straight-tooth gear drives the driving gear bar to move upwards or downwards; when the lifting rack is out of order and becomes immovable, the driving gear bar cannot move upwards or downwards and so the clutch straight-tooth gear and the second clutch gear cannot rotate smoothly; when the first clutch gear is driven to rotate by the motor and the set of gears, the first clutch gear compresses the clutch spring and moves away from the second clutch gear; the first clutch gear and the second clutch gear skid at the point of contact, thus releasing the driving force generated by the rotation of the motor.

4. An internal safety structure for toasters as in claim 1, which is characterized in that the driving gear bar is connected to the lifting rack securely.

5. An internal safety structure for toasters as in claim 1, which is characterized in that the lifting rack has a latch disposed in a position corresponding to the upper sensor and the lower sensor; when the lifting rack ascends to a horizontal position corresponding to that of the upper sensor, the latch contacts the upper sensor and the upper sensor immediately sends electrical signals to the circuit board; the preset programs of the integrated circuit of the circuit board control the motor to stop rotating; the lifting rack is then stopped from ascending continuously; when the lifting rack descends to a horizontal position corresponding to that of the lower sensor, the latch contacts the lower sensor and the lower sensor then immediately sends electrical signals to the circuit board; the preset programs of the integrated circuit of the circuit board control the motor to stop rotating; the lifting rack is then stopped from descending continuously.

6. An internal safety structure for toasters as in claim 1 or 4, which is characterized in that one side of the lifting rack connects to a holder placed inside

the toaster slots and the other side is connected to the driving gear bar; the upward or downward movements of the driving gear bar drive the lifting rack to move upwards or downwards accordingly; the lifting rack drives the slices of bread on the holder to move upwards or downwards accordingly.

7. An internal safety structure for toasters as in claim 1, which is characterized in that the integrated circuit of the circuit board contains custom software to preset timing for the programs; it automatically cuts off the power supply to the motor after the expiration of the preset time limit, so as to stop the motor from rotating continuously; the preset time limit is 5 to 30 seconds.

8. An internal safety structure for toasters as in claim 1, which is characterized in that the power supply of the heating wire uses a relay as a switch; the relay is electrically connected to the power source, the circuit board and the heating wire respectively, and is operated and controlled by the preset programs of the integrated circuit of the circuit board; upon completion of the preset programs, the power supply to the relay is automatically cut off and the relay immediately cuts off the power supply to the heating wire; when the descending procedure of the lifting rack functions improperly, the lower sensor does not send any electrical signal to the circuit board, and the circuit board does not supply power to the relay and so the relay does not switch on the heating wire.

9. An internal safety structure for toasters as in claim 1, which is characterized in that the circuit board contains a set of specially designed circuits which controls in a manner that when any fault, abnormality or overheating occurs in the timing or circuit programs of the circuit board, the circuit board sends instructions to cut off the power supply to the heating wire.

10. An internal safety structure for toasters as in claim 1 or 2, which is characterized in that the motor, the set of gears and the set of clutch gears are disposed inside a substantially enclosed casing; the casing is placed on one side of the circuit board; the casing encloses the noise generated by the rotation of the motor, the set of gears and the set of clutch gears.

DRAWINGS

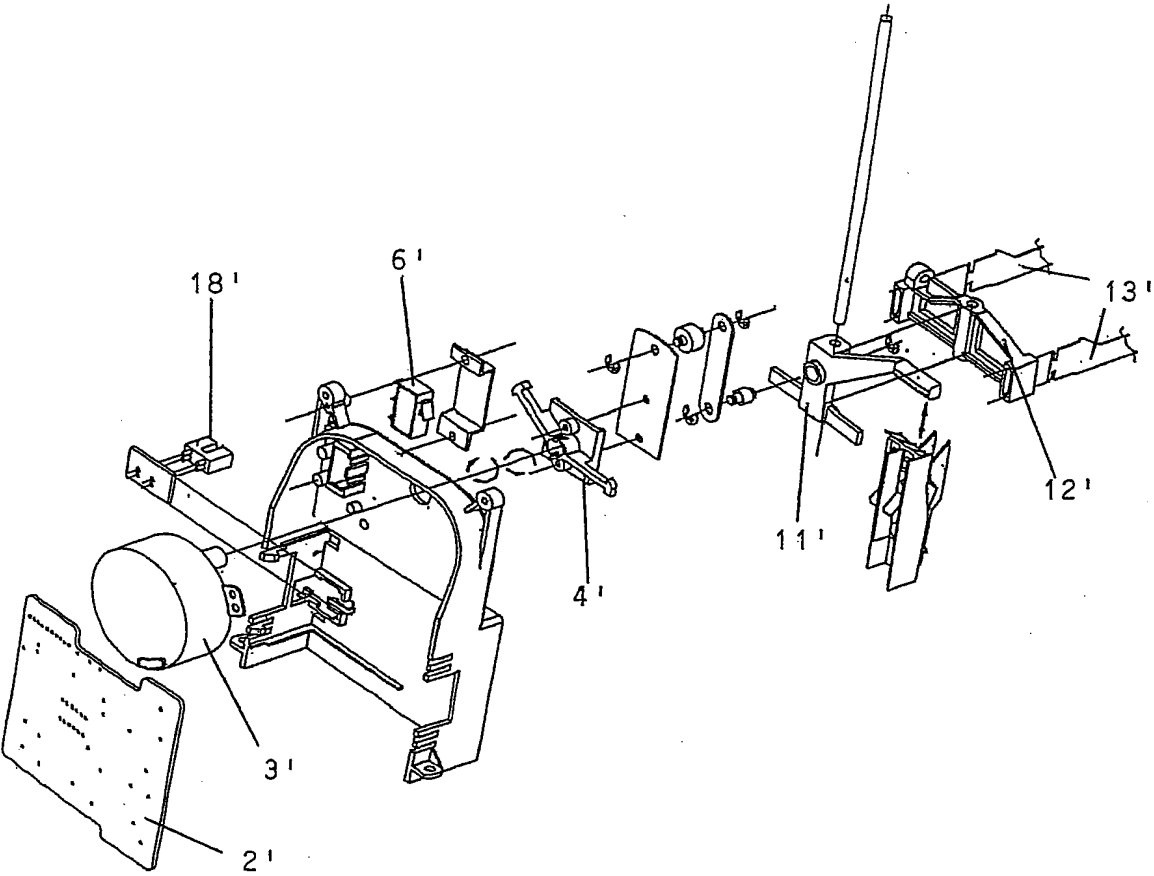


FIG.1

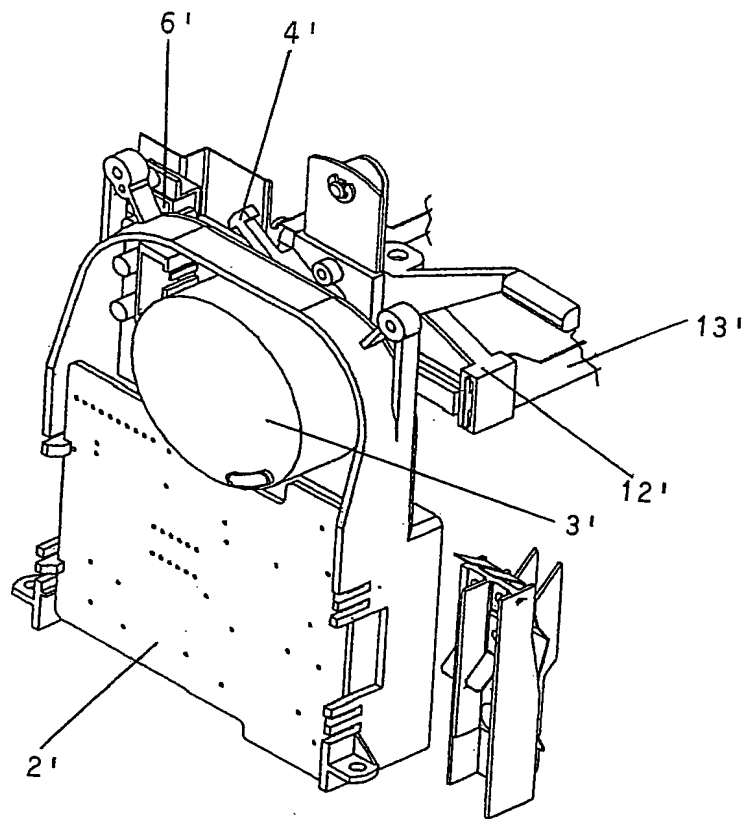


FIG.2

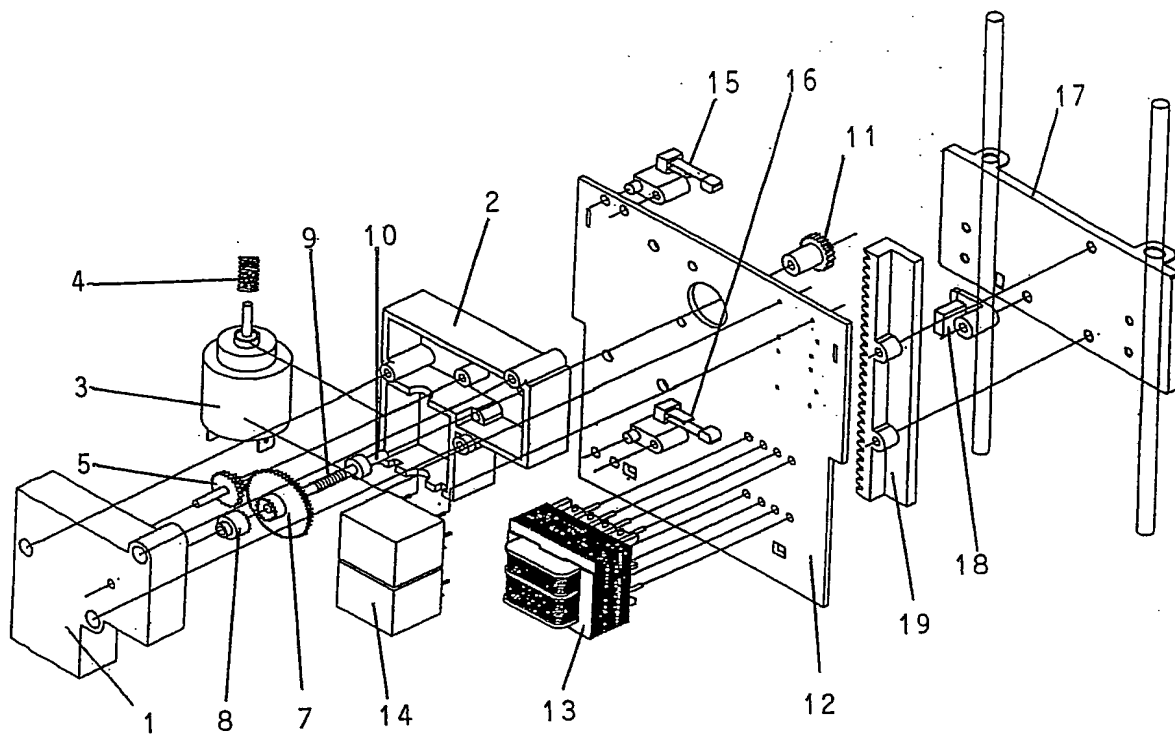


FIG.3

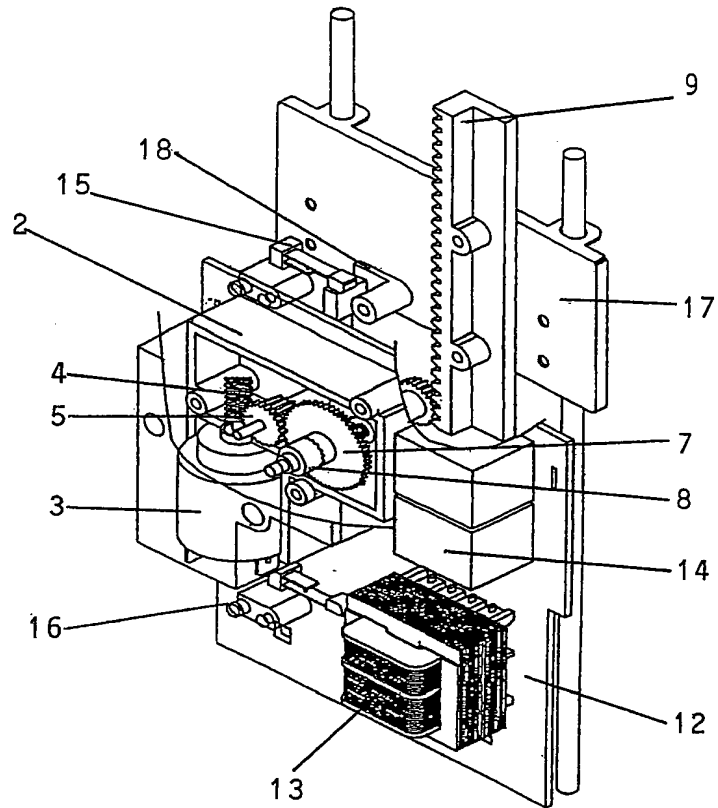


FIG.4

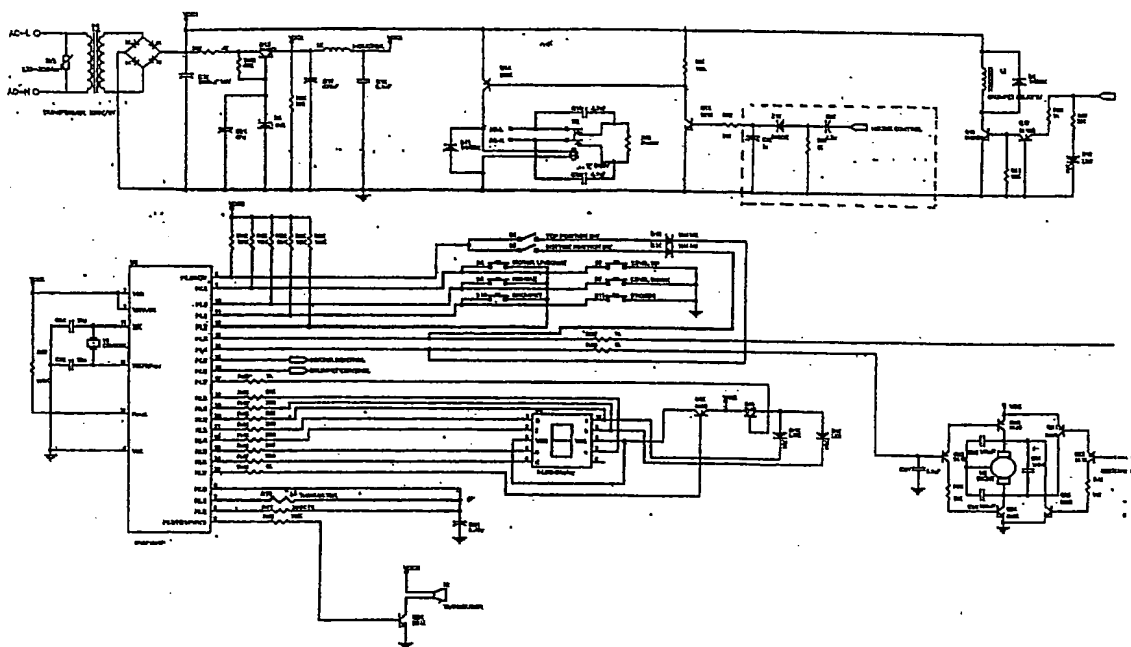


FIG.5

ABSTRACT

An internal safety structure for toasters

The present invention discloses an internal safety structure for toasters comprising a circuit board (12), a motor (3), a lifting rack (17) and others. The motor (3) is a low voltage direct current motor driving the lifting rack (17) to move upwards or downwards through a set of gears, a set of clutch gears and a driving gear bar (19). On the circuit board (12), an upper sensor (15) and a lower sensor (16) are installed to sense the lifting level of the lifting rack (17), and a transformer (13) is installed to reduce the voltage of alternating current of power to the circuit board (12) and the motor (3) through a set of diode rectifiers changing alternating current to direct current. The present invention is of simple and reliable construction, susceptible of low production costs and consumes low energy. It is economical and durable and produces less noise.

DRAWING FOR THE ABSTRACT

